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**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE
STATE OF CALIFORNIA**

Order Instituting Rulemaking to Oversee
the Resource Adequacy Program,
Consider Program Refinements, and
Establish Forward Resource Adequacy
Procurement Obligations.

Rulemaking 19-11-009

**SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E), CALPINE CORPORATION,
AND EAST BAY COMMUNITY ENERGY'S JOINT REPORT FOR THE TRACK 2
EFFECTIVE LOAD CARRYING CAPABILITY WORKING GROUP**

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Dated: **March 11, 2020**

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Pursuant to the *Assigned Commissioner's Scoping Memo and Ruling* issued on January 22, 2020 and the *Administrative Law Judge's Ruling Modifying Track 2 Schedule* issued on February 28, 2020, Southern California Edison Company ("SCE"), Calpine Corporation ("Calpine"), and East Bay Community Energy ("EBCE") hereby submit this joint report for the Track 2 Effective Load Carrying Capability ("ELCC") Working Group ("Working Group Report")¹ attached as Attachment 1.

Respectfully submitted on behalf of
Southern California Edison Company,
Calpine Corporation, and
East Bay Community Energy

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¹ Pursuant to Rule 1.8(d) of the Rules of Practice and Procedure of the California Public Utilities Commission, Calpine and EBCE have authorized SCE to file this Working Group Report on their behalf.

Attachment 1

Working Group Report

Report of the Track 2 Effective Load
Carrying Capability Working Group
(R.19-11-009)

March 11, 2020

Background

Procedural Background

On November 13, 2019, the California Public Utilities Commission (“CPUC” or “Commission”) issued an Order Instituting Rulemaking (“OIR”) to continue to address the 2021 – 2022 Resource Adequacy (“RA”) compliance years and to consider necessary refinements to the RA program. On January 22, 2020, the *Assigned Commissioner’s Scoping Memo and Ruling* (“Scoping Memo”) outlined the proceeding scope and schedule and directed parties to establish a working group process to address issues related to the qualifying capacity counting conventions and requirements for various resource types, including hydro resources, hybrid resources, and third-party demand response resources. In response, parties formed four working groups to discuss specific topics related to (i) Hybrid Resources; (ii) Hydro Resources; (iii) Demand Response Resources; and (iv) Effective Load Carrying Capability (“ELCC”).

The Scoping Memo established a schedule for counting convention proposals, calling for working groups to meet beginning in early February 2020, serve Progress Reports on February 14, 2020, and file reports on consensus and non-consensus items on March 2, 2020. On February 28th, Administrative Law Judge (“ALJ”) Chiv modified the schedule and postponed the deadline for filing working group reports until March 11, 2020.

In accordance with ALJ Chiv’s February 7, 2020 email ruling granting the request for three co-chairs for the ELCC Working Group, Southern California Edison Company (“SCE”), Calpine Corporation (“Calpine”), and East Bay Community Energy (“EBCE”) volunteered to co-chair the ELCC Working Group. The ELCC working group met on February 13, 2020 at the CPUC. WebEx and call-in information was also made available to parties on the proceeding service list.

On February 25, 2020 a draft of the ELCC working group Report was circulated to the service list for informal feedback. The co-chairs initially asked for informal comments on the report no later than February 26, however on March 2, 2020 the co-chairs extended this deadline until March 6, 2020 as a result of the extension of the filing date for the ELCC working group Report. Informal feedback received from parties has been incorporated into this report.

Working Group Scope

The Scoping Memo directed parties to consider the following questions related to the ELCC methodologies:

- Should marginal rather than average ELCC values be used for wind and solar resources?
- If so, how should this transition be implemented, given that current practice is to adjust all wind and solar resources’ ELCCs with each new ELCC study?

The Scoping Memo also allowed for parties to identify other time sensitive issues related to potential RA program refinements. The ELCC working group therefore considered a discussion of the applicability of an ELCC qualifying capacity (“QC”) counting methodology to energy storage resources to be in scope.

Working Group Proposals

The ELCC working group met on February 13, 2020 at the CPUC 9:00 a.m. to 12:00 p.m. At the meeting, SCE presented a proposal to transition to a marginal ELCC for solar and wind resources and Calpine

presented on storage ELCC issues. No other party requested to present. The Scoping Memo allowed for parties to file additional proposals by February 21, 2020.

Form Energy filed Track 2 Proposals on February 21, 2020 that include the use of a marginal ELCC value for wind, solar, hybrid, and storage resources. Form Energy's Proposals are included in full in Appendix B of the working group report.

Marginal ELCC Proposal (Track 2 Issue 4.b.vi)

Should marginal rather than average effective load carrying capability (ELCC) values be used for wind and solar resources? If so, how should this transition be implemented, given that current practice is to adjust all wind and solar resources' ELCCs with each new ELCC study?

Proposal

SCE proposes to transition to a marginal ELCC approach to assign the QC of new wind and solar resources.¹ SCE believes that a marginal ELCC methodology is a reasonable interim step in order to provide market signals to properly value the procurement of resources. In a market with very high levels of renewable resources to meet policy objectives, the current RA structure that evaluates the ability of peak load need and utilizes Maximum Cumulative Capacity buckets to ensure that all load hours can be met may not be able to properly depict the reliability of the grid. SCE believes this longer-term issue can be addressed in Track 3 of this proceeding, which is considering more complex structural changes to the RA program. The marginal ELCC proposal would grandfather existing RA resources at the current resource average ELCC value established by the CPUC until retirement. If there is a significant change (e.g., a material decline) from the existing values to the updated ELCC values at the time when the marginal ELCC methodology is adopted, SCE recommends that all existing renewable resources should be given their RA value based on the updated average ELCC values when the marginal ELCC is adopted.² New, incremental wind and solar resources would be assigned a marginal ELCC value when they become operational. Each resource would retain its initially assigned ELCC value until retirement unless aggregate resource fleet ELCC values materially overstate the RA value of the resource fleet. This could happen given the observed trend of substantially declining ELCC over recent years and anticipated increasing behind-the-meter and in-front-of-the-meter solar resources. There could be a time in the future when the ELCC values, based on the average ELCC methodology, approach zero for the aggregate solar fleet, but existing solar resources would still be counted based on the non-zero or above-zero ELCC values using the marginal ELCC methodology. If this happens, the reliability contribution of the solar fleet will likely be overstated, and the SCE believes the CPUC should reduce the ELCC value for all resources to a value that reflects the actual RA value of the fleet.

¹ SCE made some refinements to its marginal ELCC proposal after the February 13 working group meeting to address the potential need to update ELCC values of existing resources when a marginal ELCC methodology is adopted and to address longer-term issues and situations where the aggregate resource fleet ELCC values may materially overstate the RA value of the resource fleet. These refinements are included in SCE's Track 2 Proposals filed on February 21, 2020 and this report.

² For example, if the marginal ELCC methodology is adopted for the 2021 RA year, then the existing ELCC values are those for the 2020 RA year and the updated values would be those for the 2021 RA year.

The proposal would update marginal ELCC values periodically, recognizing that marginal ELCC values change as the underlying portfolio of resources changes. The CPUC would adopt a methodology to determine the frequency of updates based on how fast the portfolio is changing.

If an existing facility expands, any additional capacity under the same interconnection and resource ID as the existing facility would receive the current marginal ELCC. The total facility ELCC would become the sum of the existing capacity at its existing ELCC and the incremental capacity at the marginal ELCC.

In a scenario where part of an existing resource retires or the amount of capacity is reduced, there would be a pro rata reduction of the facility QC for each MW that is retired. Re-powering of a facility of the same technology would not result in a new ELCC.

Status

Non-Consensus

Working group participants did not take a final position on the marginal ELCC proposal. There was majority support among the working group attendees to improve consistency across proceedings, specifically the Renewables Portfolio Standard (“RPS”) and RA proceedings. As noted below, PG&E, the Public Advocates Office and the American Wind Energy Association of California (“AWEA-CA”) further clarified their positions on the question of consistency. There was broad support for the discussion of additional refinements to the ELCC methodology, including sub-technology and locational differences. These issues are discussed further below.

Discussion

Support for Marginal ELCC

The topic of marginal versus average ELCC for assigning solar and wind QC values has been considered in multiple RA proceedings at the Commission. Parties that support a transition to using marginal ELCC values point to several benefits. A marginal ELCC calculation provides an accurate assessment of the reliability benefit each resource provides at the time it begins operations. Thus, it provides a more accurate signal for new investment. In other words, the marginal ELCC value answers the question “Given the existing portfolio of resources, what is the capacity value of adding one increment of a specific resource type?” while the average ELCC value better answers the question “What is the total capacity value of a specific type of resource in the existing portfolio?” The working group co-chairs believe that the former question is most appropriate for determining QC values of new resources in the RA program. Conversely, under the current average ELCC approach, existing resources may experience declining capacity values as more resources of the same type are added to the portfolio, while new resources may benefit from the existing capacity value provided by the same resource type, regardless of their incremental reliability contribution. Not only does this provide inappropriate incentives, but it also leads to shifting QCs for existing resources, which complicates contracting and RA compliance for both suppliers and LSEs. The marginal ELCC approach proposed by SCE would result in a more stable QC value over the duration of a resource’s operating life and simplify contracting and RA compliance.

Another argument presented in support of transitioning to a marginal ELCC approach is that it would align with the treatment of ELCC in the RPS program. D.19-09-043 adopted marginal ELCC values for the investor-owned utilities’ (“IOUs”) RPS program bid ranking and selection. One reason to align RPS and RA ELCC methodologies is that while the IOUs are required to use marginal ELCCs in their RPS least-cost,

best-fit methodologies, other load-serving entities (“LSEs”) are not. Consequently, they may consider the RA compliance value of renewables in their own valuations. If the compliance value is based on average rather than marginal ELCC, non-IOU LSEs may face inappropriate incentives to invest in resources that contribute to their own RA compliance, but do not actually increase reliability. During the working group meeting, the majority of parties present supported seeking greater consistency across proceedings, although it was pointed out by Pacific Gas and Electric Company that there are many examples of inconsistencies across the RPS and RA proceedings beyond using marginal versus average ELCCs, e.g., RPS ELCC values are annual while RA ELCC values are monthly, and the Public Advocates Office pointed out that RPS and RA proceedings have different objectives, i.e., the RA program may not drive new investment. AWEA-CA indicated that while it is generally supportive of consistency across programs, it is also important to recognize that metrics for programs may vary depending on the programmatic goals. Further, in the case of the RPS and RA programs, the use of a marginal ELCC in the RPS program is presently immaterial to RA Track 2. Based on the 2019 RPS procurement plan filings, the large IOUs do not propose procurement of new RPS resources anytime soon. For example, PG&E does not anticipate a need for new RPS procurement until 2033. Thus, while AWEA-CA is generally supportive of consistency across proceedings, in light of other concerns (implementation challenges, vintaging concerns), alignment of the RPS and RA proceedings is unnecessary at this time.

Issues and Opposition

Parties supporting the continued use of the average ELCC methodology argue that switching to a marginal methodology would pose numerous logistical and implementation challenges, including the need to redesign the existing modeling. Supporters of the average methodology believe that over time, the average methodology results in a more significant derate as more facilities of the same technology type are brought online. In this way, the existing, average ELCC methodology already accounts for the relative contribution of a resource compared to the existing system. In addition, parties have expressed concern about the potential for vintaging issues that could arise from having different ELCC values applied depending on when resources that are otherwise similarly situated (e.g., in terms of their generation profile) come online.

As mentioned above, the transition to marginal ELCC values has been considered in prior RA proceedings. SCE’s proposal therefore addresses certain issues that have previously been raised.

1. *Prior Issue: Why would an existing facility not get an increase in ELCC if the most recent study shows a higher marginal value than they previously received?*
 - The higher marginal value would reflect changes in the resource portfolio and consequently should be ascribed to the resources that are being added to the portfolio, not existing resources.
 - Incentives at the time of design, development, and construction are equally important to ensure that the development of resources meets not only the policy goals, but reliability goals as well.
 - Assigning a higher ELCC value later because of actions taken by others (e.g., diversity benefits or developing other resources after an ELCC has already been established) is not an appropriate incentive to provide to a resource that was developed based upon a different set of conditions.

- Any allocation of incremental ELCC value to existing resources would require an additional methodology be developed and could increase complexity.
2. *Prior Issue: What if a new technology can be employed at an existing site that would provide it with a higher ELCC?*
- If such a development came along, the RA proceeding should consider this impact and address it at that time.
 - If the results are verifiable, the deployment of the new technology could be treated like a resource expansion and an ELCC to account for the addition could be created.

New issues, concerns and opposition raised by parties during the working group meeting or in informal comments on the draft working group report are summarized below. Similar points made by parties have been consolidated.

3. *SCE: What if new resources continue to be built even after the marginal value has gone to zero? Doesn't this mean that the existing resources are over-valued?*
- SCE's perspective is that this is a potential outcome that is better addressed in Track 3 of this proceeding to address alternative mechanism to ensure that all energy and capacity needs are met with an increasing reliance on use limited resources. Additionally, if the aggregate resource fleet ELCC values materially overstate the RA value of the resource fleet, the CPUC should reduce the ELCC value for all resources to a value that reflects the actual RA value of the fleet.
 - The California Independent System Operator ("CAISO") reacted to this issue, stating they did not believe this concern to be a problem. If the marginal capacity value of a new resource is zero there is no incremental capacity contribution of the next MW of that resource type, but the ELCC does not become negative. Nonetheless, in SCE's proposal submitted after the working group meetings, SCE suggested that a marginal ELCC could be reviewed in the future if the implementation of renewable resources came to a level that the reduction in the loss of load probability from the entire fleet of renewable resources became zero.
4. *American Wind Energy Association ("AWEA"): Wouldn't a transition to marginal introduce complex accounting inconsistencies? For example, if a marginal approach is adopted moving forward the sum of the existing and new resource QCs may not reflect a fleetwide average.*
- The working group co-chairs recognize that it is important to consider any unintended consequences of a transition to marginal ELCCs; however, they believe that marginal ELCC can be implemented in a manner that ensures that the ELCCs of individual resources sum to the aggregate ELCC of a resource type.
5. *Multiple Parties: Aren't there issues with equity, where new resources would be penalized under a marginal approach?*
- AWEA-CA are concerned that the implementation of a marginal ELCC methodology in the context of the Resource Adequacy proceeding could have a discriminatory impact on new resources that are similarly situated in terms of their generation profile (i.e., new resources would be subject to a more significant derating than similarly situated resources from earlier vintages).

- A marginal ELCC approach does account for diminishing returns as additional resources of a specific type are added to the system; on the other hand, as Peninsula Clean Energy (“PCE”) pointed out under the existing average ELCC approach all resources experience a reduction in their ELCC values as new, like resources with lower capacity contributions are added to the portfolio.
 - PCE also pointed out that a fixed (or “vintaged”) marginal capacity value would allow for more certainty in the capacity value over the resource lifetime, which could make financing easier for resources. Form Energy agrees, arguing that a marginal ELCC that is assigned to a specific resource at its commercial operation date can “provide stable investment signals that will help LSEs and market participants understand how the reliability value of specific resources, namely variable renewables and energy storage, will vary over time as resource portfolios evolve...”
6. *California Large Energy Consumers Association (“CLECA”): Doesn’t grandfathering ELCCs introduce issues with sending improper investment signals? For example, the decision between investing additional capital in an existing resource versus investing in a new resource might result in suboptimal outcomes.*
- The working group co-chairs don’t believe that grandfathering itself is problematic, however there are design considerations required to prevent undesired or illogical outcomes. Grandfathering existing resources at the average ELCC value at the point of transition to marginal ensures that the reliability contribution of existing wind and solar is accurate based on the existing portfolio of resources. Vintaging new resources with the marginal ELCC at the time they are added to the portfolio ensures that new resources are assigned the appropriate reliability value and provides certainty over the lifetime of the resource.
 - The decision to invest additional capital in an existing resource compared to a new resource includes multiple factors, including ELCC. Under SCE’s proposal, if there is investment in an existing resource that results in increased nameplate capacity, the incremental capacity would be assigned the same marginal ELCC that a new resource would receive. Any investment to maintain the originally derived ELCC would simply retain that original ELCC. Investment to maintain a plant generally occurs in small increments over time. For wind and solar is may be the replacement of a single turbine among many in a wind farm or the replacement of a few panels or inverters in a solar facility. SCE believes it is unlikely that a facility will age to the point of complete replacement and then rebuild at an ELCC not consistent with the market at that time. Rather there will be a gradual replacement of portions of the facility over time for which a marginal ELCC for each individual piece is not practical nor is it appropriate.
7. *Multiple Parties: How would diversity benefits be allocated?*
- There are different approaches to allocating diversity benefits. The working group co-chairs recommend this issue be revisited if marginal ELCC continues to be considered.
8. *California Environmental Justice Alliance: The Integrated Resource Planning (IRP”) proceeding shows a need for a lot of incremental solar build; if there is a transition to marginal ELCC, is there a risk the state does not build the resources necessary to achieve its IRP targets?*

- The IRP results show essentially no marginal ELCC for new solar, but it is built along with new storage as part of the optimal, least-cost solution to satisfying the IRP’s greenhouse gas emissions targets.
 - It is true that new solar resources would see a lower capacity value if a marginal approach was adopted today; however, new resources may be built for other reasons than capacity.
9. *California Wind Energy Association: How would repowering at an existing site with a new technology be addressed?*
- Repowering should be expected. As resources age, it is common to replace elements to maintain the operating characteristics either to provide to the grid or due to contractual obligations. If this simply maintains the original installed capacity upon which its ELCC was based, the ELCC should remain the same. During the working group meeting, SCE noted that if the new technology significantly shifted production and changed the contribution to reliability, then the new technology addition could be evaluated in a manner reflecting its contribution to reliability. SCE also notes that Energy Division staff cautions whether ELCC can accurately reflect such granular differences.
10. *The QC of hybrid systems could be impacted if a marginal ELCC for wind and solar is adopted*
- CESA notes that combined ELCC values may not be appropriate for hybrid systems – an issue that is being addressed in a separate Hybrid QC Working Group.
11. *Timing issues raised by parties:*
- If a marginal ELCC were to be adopted, the Commission should set the future transition date with a long enough lead time that ongoing negotiations would not be adversely affected.
 - Marginal ELCC values may change between when project valuation occurs and COD. Assigning the marginal ELCC value at an earlier date- such as the date of interconnection agreement- would provide more certainty during contract negotiations.

The scope of the conversation expanded to include discussion of incorporating further refinements to the ELCC methodology, including geographic specificity and sub-technology specific ELCC values. Parties reactions are summarized below.

12. *The Utility Reform Network (“TURN”): Expressed concern over plausibility and stability of results if there are continual modifications to the ELCC approach.*
13. *Energy Division: Discussed differences between precision and accuracy, and that introducing more complexity to incorporate location and technology sub-types may affect the accuracy of the results. These concerns apply to both marginal and average ELCC approaches.*
14. *CLECA: Believes the current lack of geographic and technological granularity differences in the ELCC may be a bigger issue than marginal versus average issue in terms of sending investment price signals for resource additions.*

It should be noted that Energy Division staff expressed concern over additional granularity and the ability of an ELCC model to accurately portray such differences. While many parties have agreed that technological and geographic differences produce a different energy output profile that provides a different RA value, it may be necessary to first begin studying the ability of an ELCC model

to portray such differences accurately. If it cannot, then perhaps additional methods to portray the reliability value of such resources is necessary.

15. *Form Energy: Proposes that the Commission develop marginal ELCC lookup tables for renewable resources, stand-alone storage and hybrid resources differentiated by renewable technology and storage duration. The lookup tables would include current and forecasted regional marginal ELCC values for a given set of years as well as information about the portfolio assumptions for each year and be updated regularly. While this approach is theoretically appealing, it may not be feasible in light of ED's concerns about the computational complexity of more granular ELCC calculations.*

Storage ELCC Proposal

Should ELCC be used to calculate storage QCs?

Proposal

Calpine proposes to base the QC of standalone storage on an ELCC methodology to capture the dynamic reliability contribution of storage with increasing penetrations. The CPUC Energy Division already calculates storage ELCCs for the RA and IRP proceedings, so the proposal would adopt storage ELCCs from an already established methodology.

Similar to wind and solar resources, the capacity value of limited-duration storage declines under increased penetrations. This is because as more storage is added to the system, the net load shape flattens, i.e., net of the impact of storage, and longer duration storage is required to further reduce peak demand. Under this proposal, the ELCC methodology applied to solar and wind in the RA proceeding would also apply to storage, as opposed to current QC methodology that provides full capacity value to storage with at least four hours duration. An ELCC methodology would account for the different capacity value provide by different storage durations at different penetration levels. Because storage ELCCs are dependent on the build-out of other resources, particularly solar, an allocation methodology of diversity benefits would need to be established for all resource types assigned an ELCC.

The proposal does not make a recommendation between average and marginal ELCC but notes that the potential for declining ELCCs under an average ELCC approach is a current commercial issue. For example, it may be difficult for developers to finance projects for which contract payments are based on a QC value that could decline significantly.

Status

Non-Consensus

While parties disagree about the need to transition to an ELCC QC methodology for standalone storage in the near term, parties agree that the CPUC should provide more certainty about the future RA counting of standalone storage. The working group co-chairs believe that there are multiple options that enable this longer term certainty, such as grandfathering the current RA counting of standalone storage for resources that reach commercial operation before a certain date and/or by committing to apply marginal ELCC to storage in the event that ELCC is applied to storage so that resources that are currently under development would be unlikely to experience significant diminution in their QCs over their operating lifetime as the result of a transition to ELCC.

Discussion

Support for Storage ELCC

EBCE and Calpine note that it is widely acknowledged that there is a diminishing capacity value of storage as increasing and significant amounts are added to the portfolio, and the CPUC's current approach for assigning storage QC does not account for this dynamic. While the marginal ELCC of 4-hour storage is currently close to 100%, as installed storage increases this value will decline. When storage reaches higher penetration levels, the existing rules will send incorrect investment signals that are misaligned with the actual reliability contribution of new storage resources. EBCE and Calpine believe delaying consideration of a storage ELCC risks further market disruptions in the future, when longer duration storage is required to reduce the system peak. Calpine also notes that ELCC is an established metric for storage, with other markets such as the NYISO already using storage ELCC to guide capacity valuation.

During the working group meeting, the CAISO expressed support for rigorous analysis of the reliability implications of reliance on energy- and/or use-limited resources including storage and demand response, and noted that storage ELCCs may decline more rapidly than projected if storage is added to the system simultaneously with other energy-limited resources. The CAISO also expressed support for consideration of storage ELCC sooner rather than later to avoid issues later on.

On February 21, 2020 Form Energy filed a Track 2 proposal that supports a marginal ELCC methodology in the RA Program for stand-alone energy storage resources as well as renewable and hybrid resources. Form Energy states that marginal ELCC is appropriate "because the reliability value of an energy storage resource is a function of both its nameplate capacity (in MW) and its capacity to store energy (in MWh)" and the marginal methodology captures how this value changes over time. Form Energy believes a marginal ELCC for energy storage resources will avoid overvaluing shorter-duration storage and undervaluing longer-duration storage resources.³

Issues and Opposition

1. *Multiple Parties (Enel, California Energy Storage Alliance ("CESA"), others): Until storage adoption reaches saturation levels there is no degradation in capacity value. Isn't it premature to consider this approach, and isn't it better addressed in the IRP proceeding?*
 - The CAISO pointed out that community choice aggregators are procuring for capacity right now, so there is a sense of urgency to get the reliability value of storage correct. Existing RA resources are retiring and should ensure that capacity value of replacement resources is accurate.
2. *Multiple Parties (CAISO, Union of Concerned Scientists, CESA, CLECA): Concerns related to the storage ELCC analysis that Astrape developed for IRP.*
 - Some parties believe Astrape's analysis yields storage ELCCs that are too high because it is based on a very large projected solar buildout and effectively ascribes all of the diversity

³ Form Energy Track 2 Proposals page 4

benefits of solar and storage to storage. In addition, it assumes a highly idealized dispatch of storage that may not be feasible.

- On the other hand, other parties believe that the Astrape analysis understates the long-term potential ELCC of storage because it does not reflect the expected post-2030 renewable buildout, which could yield additional solar/storage diversity benefits.
3. *Multiple Parties (CESA, AWEA): There are contracting concerns with using a storage ELCC and the ability to facilitate financing.*
 - Grandfathering and vintaging could be tools to address these issues.
 4. *CESA: Solar and storage have complementary reliability effects. How are diversity benefits accounted for?*
 - The working group co-chairs agree that diversity benefits will need to be addressed.
 5. *AWEA-CA: Statute prescribes the use of ELCC for solar and wind RA counting. Is this prescription exclusive? Would additional legislation be required to apply ELCC to storage?*
 - The working group co-chairs believe that the CPUC has broad discretion to determine the RA counting methodology for storage.
 - AWEA-CA agreed that the Commission has broad discretion in implementing the RA program, but also pointed out that Section 399.26 of the Public Utilities Code by its terms only applies to wind and solar, and based on plain reading of the statute, the Legislature could have applied to the methodology to storage devices, but did not.
 - AWEA-CA also pointed out that the application of an ELCC methodology that derates storage facilities could create new risk and uncertainty in developers attempts to obtain financing for projects that are being marketed to meet the 2017-18 IRP procurement target as well as future RA needs.
 6. *PCE: Capacity value may not be appropriate reliability measure moving forward.*
 - PCE seemed to be questioning whether the current RA reliability paradigm is appropriate for a future in which many resources will be fuel/energy/use-limited. The working group co-chairs acknowledge PCE's concern and believe that the more fundamental reconsideration of the RA program would be appropriate for Track 3 of this proceeding.
 7. *TURN and CLECA: Concern about expanding use of ELCC given its computational complexity and the fact that it may yield results that are not stable.*
 8. *CAISO: ESDER initiative could be appropriate venue to consider how storage could be optimized and participate in CAISO markets in the operational time frame as well as potential implications for how storage is operating for its RA counting.*

Conclusions and Recommendations

While there was no consensus on the proposals presented during the working group meeting on February 13, 2020, parties did agree on several issues. First, the issue of better alignment across methodologies used in different proceedings received majority support. The working group suggests

additional discussion of the various differences between the RPS and RA proceeding and prioritization of areas to pursue greater consistency. Support was expressed for the notion that a “Technical Review Committee” composed of representatives of this working group and/or the Hybrid Resource Counting working Group be added to the Joint IOU study to determine marginal ELCC values for new resources to be used in procurement activities to provide more consistency and timely feedback into the RA proceeding. In addition, there was broad support from participants to further explore additional refinements to the ELCC methodology, including sub-technology ELCC values and locational differences. While these issues are worth considering, as highlighted by Energy Division during the meeting, there is a risk to increasing the complexity of the ELCC calculation. The working group co-chairs recommend these trade-offs be explored.

In addition, the co-chairs recommend further study of the application of ELCC to storage for RA counting. In the interim, co-chairs believe it would be helpful for the Commission to provide certainty with respect to how QC s for existing storage resources will be treated in the event of a transition to an ELCC methodology, perhaps by committing to grandfather the RA counting of existing resources at the time of the transition or by applying a marginal approach so that the QCs of existing resources do not decline precipitously at the transition and/or thereafter. As noted in the summary above, not all parties are supportive of a grandfathering and vintaging methodology.

Appendix A: Proposal Slides

The slides presented during the working group meeting on February 13, 2020 are included below.

Marginal v. Average ELCC

CPUC Resource Adequacy Working Group
February 13, 2019

Background

- How did ELCC come into existence?
 - ELCC was mandated by state law in April 2011 (SBX1 2)
 - The law required the CPUC to determine and use an Effective Load Carrying Capacity to establish the contribution to resource adequacy from wind and solar resources
- What does ELCC do?
 - In conducting its examination of ELCC, the CPUC described ELCC as follows:
 - ELCC is a percentage that expresses how well a resource is able to meet reliability conditions and reduce expected reliability problems or outage events (considering availability and use limitations). It is calculated via probabilistic reliability modeling, and yields a single percentage value for a given facility or grouping of facilities. ELCC can be thought of as a derating factor that is applied to a facility's maximum output (Pmax) in order to determine its QC. Because this derating factor is calculated considering both system reliability needs and facility performance, it will reflect not just the output capabilities of a facility but also the usefulness of this output in meeting overall electricity system reliability needs.

Background (continued)

- What is causing concerns presently?
 - It has been recognized that the ELCC calculated value of RA from renewable resources will decline with increased implementation of a particular type of renewable resource
 - This is caused by the introduction of more MWs of capacity that produce coincident with its class
 - This eventually saturates the system at a point in time with no additional load to serve
 - The loss of load probability during these periods decreases but may increase in periods when ambient conditions do not produce energy from the renewable technology
 - The problem that this then creates is that one can choose to either de-rate the RA value for all resources in the class (average ELCC) or value the incremental contribution of new resources in the class at the time that they are made operational (marginal ELCC)
- Does ELCC apply in other proceedings?
 - D.19-09-043 adopted marginal ELCC values for RPS program bid ranking and selection. The RA proceeding has not adopted a similar process

Marginal ELCC and this Working Group

Track 2 Issue 4.b.vi:

- Should marginal rather than average effective load carrying capability (ELCC) values be used for wind and solar resources?
- If so, how should this transition be implemented, given that current practice is to adjust all wind and solar resources' ELCCs with each new ELCC study?

SCE Proposal

- A marginal ELCC is a better solution as it:
 - Aligns the incentives between RPS and RA
 - Provides better investment signals from the incremental RA value of resources being procured to meet RPS
- How it would work:
 - The marginal ELCC value for a solar or wind resource will be retained for the life of the resource
 - Facility expansion/retirement
 - Additional plant capacity will receive the current marginal ELCC and the additional capacity must be under the same interconnection and resource ID
 - 100MW existing capacity with its marginal ELCC at 14%. 20MW added capacity with new marginal ELCC at 10%. Total plant QC is 16MW (i.e., 14MW + 2MW)
 - Plant retirements will result pro-rata reduction in its QC
 - The retirement of each MW of installed capacity would reduce by $1/120 * 16\text{MW} = 0.13\text{MW}$
 - No re-open with the same technology is allowed. This is to avoid the gaming by simply shuttering and re-opening the facility to obtain a higher marginal ELCC
 - Marginal ELCC will be updated periodically
 - The length of the period will be dependent on the build out of the technology
 - Slow build out less frequent ELCC update, fast build out more frequent ELCC update

Prior Questions

- Why would an existing facility not get an increase in ELCC if the most recent study shows a higher marginal value than they previously received?
 - Incentives at the time of design, development, and construction are equally important to ensure that the development of resources meets not only the policy goals but reliability goals as well
 - Giving a higher value later because of actions taken by others (e.g. diversity benefits or developing other resources after an ELCC has already been established) is not an incentive to appropriately provided to a resource that developed based upon a different set of conditions
 - While giving incremental ELCC value to existing resources could occur, it will effectively reduce the value of building any new resource
 - This could be a lesser impact in an environment where new resources are not needed to meet reliability needs
 - Any allocation of incremental ELCC value to existing resources would require a methodology to do so that could be complicated

Prior Questions (Continued)

- What if a new technology can be employed at an existing site that would provide it with a higher ELCC?
 - If such a development came along, the RA proceeding should consider this impact and address it at that time
 - If the results are verifiable, the deployment of the new technology could be treated like a resource expansion and an ELCC to account for the addition could be created

SCE proposal on transition

- SCE proposes the following approach for transition:
 - All existing resources are provided the current ELCC value as established by the CPUC and will retain that value until resource retirement
 - All future resources will receive the marginal ELCC that is applicable during the period that they become operational
 - This ELCC will be retained until the resource retires

New Questions

- What if new resources continue to be built even after the marginal value has gone to zero? This will mean that the existing resources are over-valued correct?
 - This is a potential outcome that SCE believes is better addressed in tracks 3 and 4 of this proceeding to address alternative mechanism to ensure that all energy and capacity needs are met with an increasing reliance on use limited resources
- Other?



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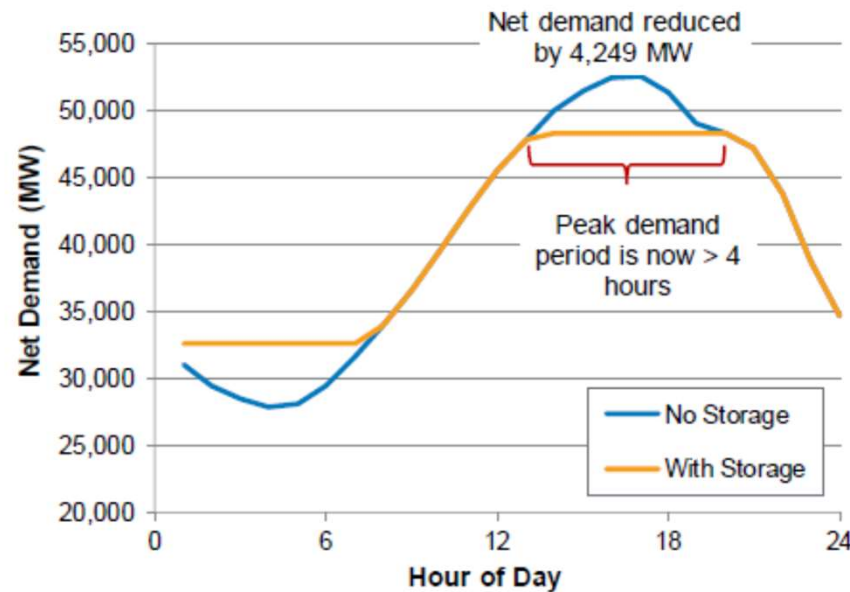
Storage ELCC discussion

Overview

- Growing reliance on energy-limited resources, such as storage, poses reliability challenges
- ELCC QC counting methodology for storage would limit such reliance
- The CPUC is already calculating storage ELCCs
- Potential policy/implementation issues

What is the issue?

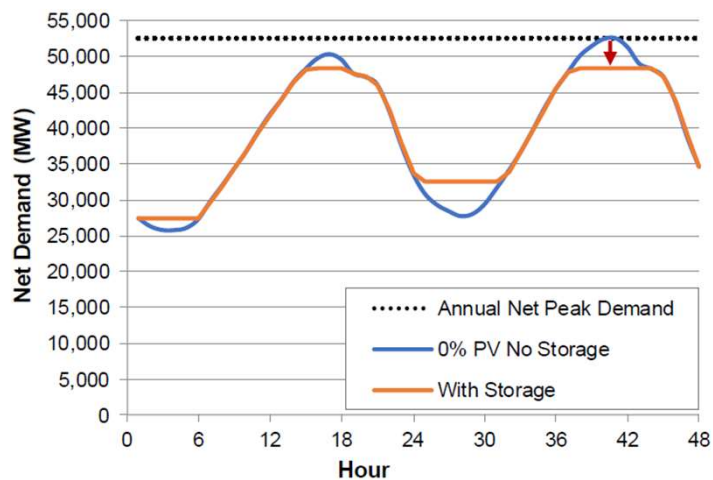
- Storage flattens peaks
- Remaining (net) load shape requires longer duration resources
- ELCC captures these dynamics for a broad set of load and renewable generation conditions



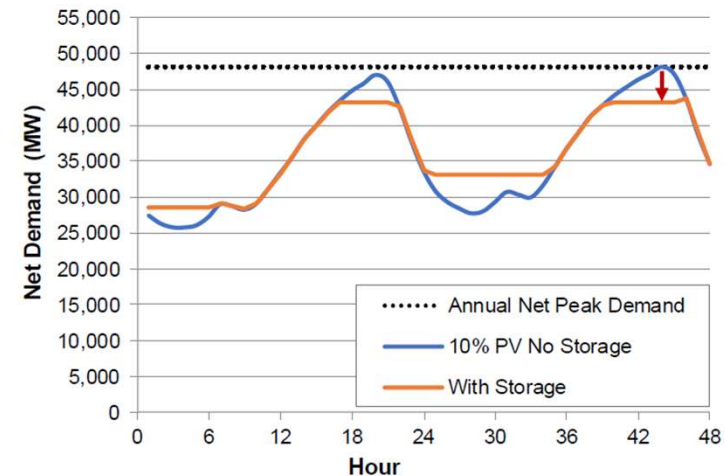
Source: Denholm & Margolis (<https://www.nrel.gov/docs/fy18osti/70905.pdf>)

PV can change the net load shape and potentially increase storage's capacity credit or reduce the storage duration needed for full capacity credit

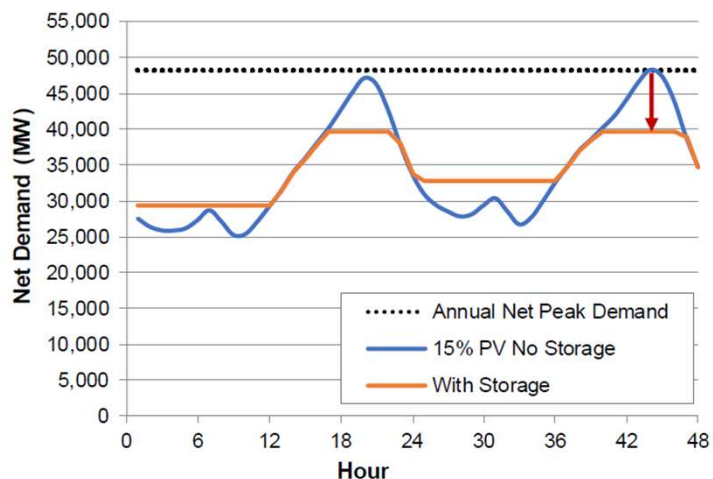
4.3 GW of storage at 100% credit



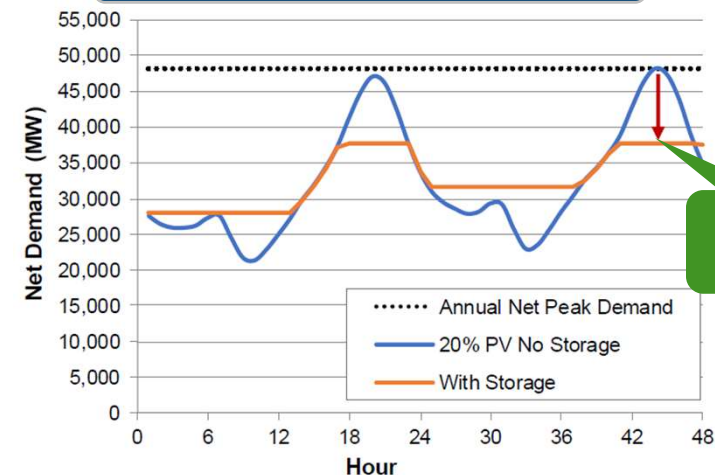
4.9 GW of storage at 100% credit



8.5 GW of storage at 100% credit



10.4 GW of storage at 100% credit

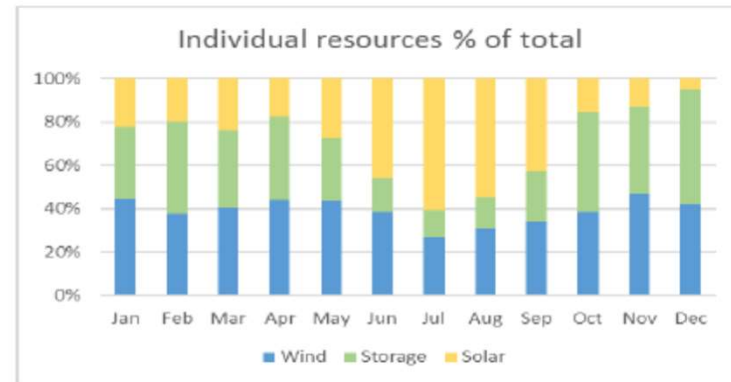
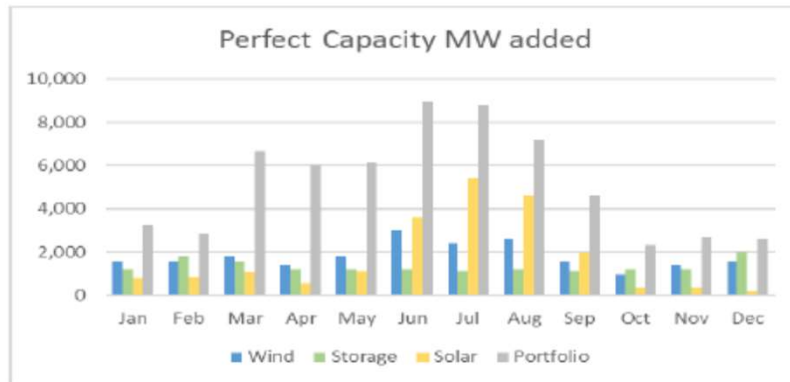


Notes: Load shape is based on peak demand day on September 6, 2011. Storage numbers are all for 4-hour storage. PV

Source: *The Potential for Energy Storage to Providing Peaking Capacity in California under Increased Penetration of Solar Photovoltaics*, Denholm & Margolis, NREL

Existing short-term ELCC analysis for California

- ED already calculates storage ELCCs for RA
- They are not currently used to determine storage QCs
- They are ~100% of nameplate at current penetrations
- Why not use these for storage QC counting?



Total Perfect Capacity MW Added to maintain LOLE target, by month

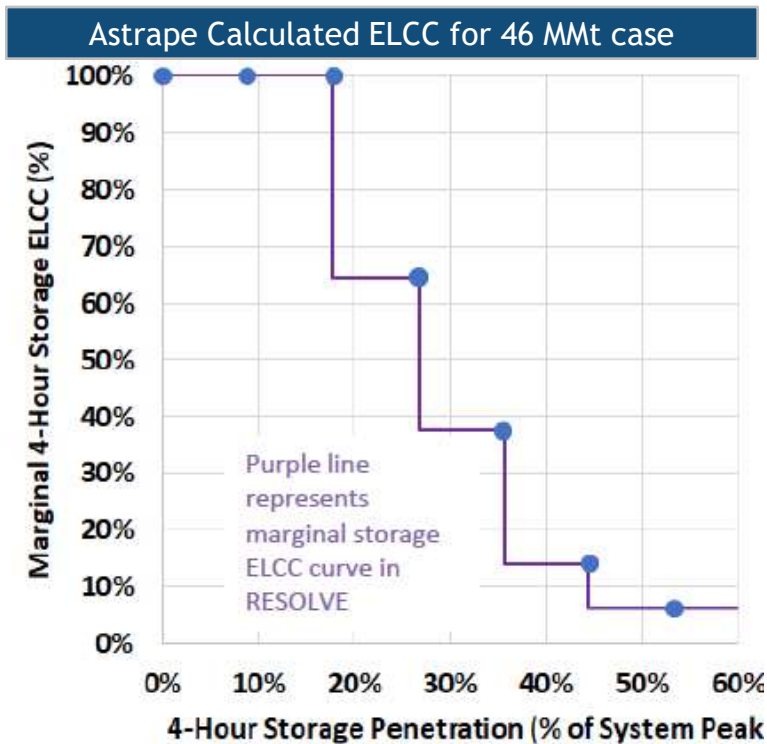
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind (10,522 MW CapMax)	1,600	1,600	1,800	1,400	1,800	3,000	2,400	2,600	1,600	1,000	1,400	1,600
Storage (1,187 MW CapMax)	1,200	1,800	1,600	1,200	1,200	1,200	1,100	1,200	1,100	1,200	1,200	2,000
Solar (13,785 MW Capmax)	800	839	1,084	554	1,128	3,594	5,400	4,594	1,994	400	400	200
Portfolio (25,496 MW CapMax)	3,257	2,839	6,684	6,000	6,128	8,936	8,794	7,200	4,600	2,300	2,700	2,600

% of Pcap added of each resource (individual resource Pcap / sum of standalone studies)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind	44%	38%	40%	44%	44%	38%	27%	31%	34%	38%	47%	42%
Storage	33%	42%	36%	38%	29%	15%	12%	14%	23%	46%	40%	53%
Solar	22%	20%	24%	18%	27%	46%	61%	55%	42%	15%	13%	5%

Existing long-term ELCC analyses for California

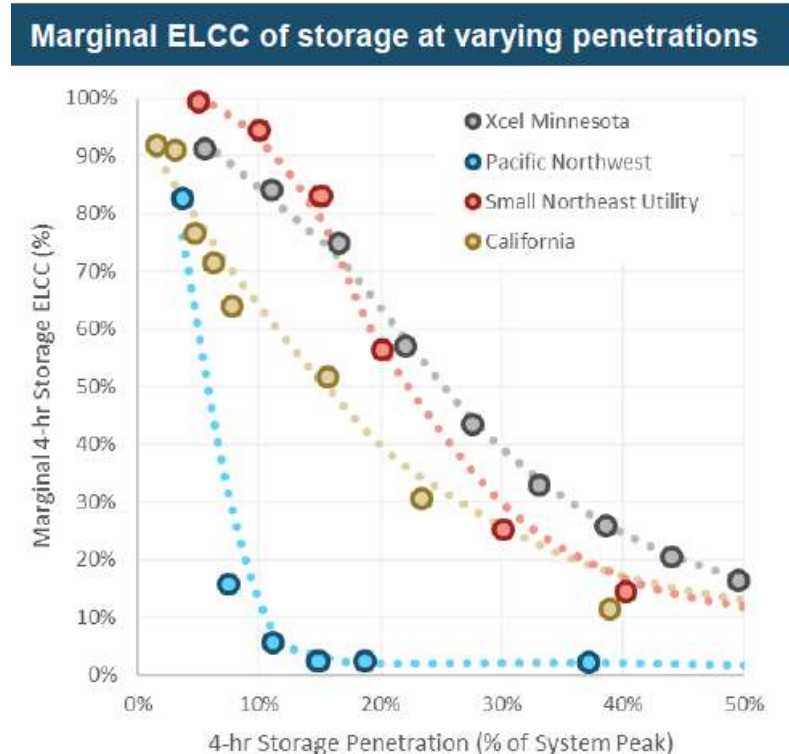
- Storage ELCCs are likely to decline at higher storage penetrations, partly depending on solar penetrations



Source: 2019 IRP

Solar Penetration 42%¹

1. Based on percent of energy

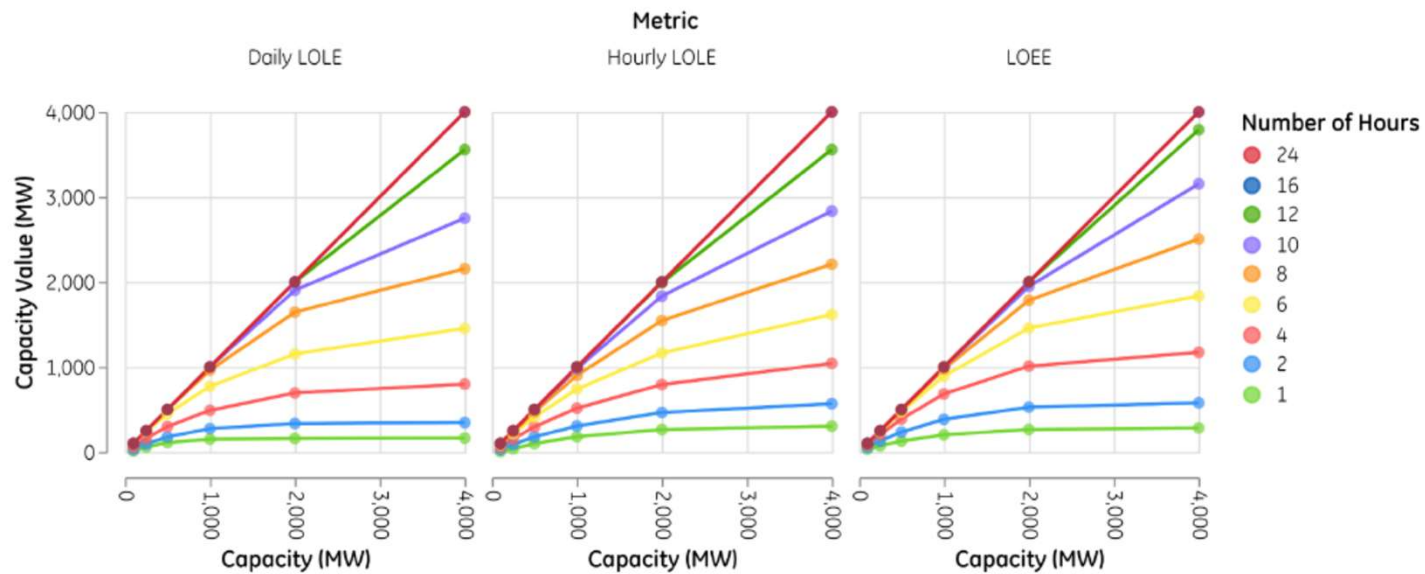


Source: East Bay Community Energy Board Meeting 6/5/2019

Solar Penetration 0%

Other markets are using ELCC for storage RA counting

Penetration Absolute Capacity Value (MW)



Valuing Capacity for Resources with Energy Limitations | 08 January 2019

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https://www.nyiso.com/documents/20142/4358080/01082019%20Capacity%20Value%20of%20Resources%20with%20Energy%20Limitations_v2.pdf/3499da16-12d8-16b7-b12f-be7650e64b63

Policy/implementation considerations

- Should ELCC be used to calculate storage QCs?
 - Other ways of addressing energy/duration limits in RA?
- If so, when and how should ELCC for storage be implemented?
 - When does saturation of 4-hour storage become a real concern?
 - Can ongoing ED staff analyses be used to calculate storage ELCCs?
 - How should storage be modeled/dispatched in ELCC analyses?
- Should storage ELCC QCs be based on marginal or average ELCCs?
 - Real commercial issue
 - Different PPAs have different allocation of NQC risk between buyers and sellers

Appendix B: Additional ELCC Proposals from Parties

The additional ELCC proposal filed by Form Energy on February 21, 2020 is included below.

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to Oversee the
Resource Adequacy Program, Consider
Program Refinements, and Establish Forward
Resource Adequacy Procurement Obligations

Rulemaking 19-11-009
(Filed November 7, 2019)

TRACK 2 PROPOSALS OF FORM ENERGY

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February 21, 2020

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OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to Oversee the
Resource Adequacy Program, Consider
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TRACK 2 PROPOSALS OF FORM ENERGY

Pursuant to the schedule set forth in the *Assigned Commissioner’s Scoping Memo and Ruling* (“Scoping Memo”) issued on January 22, 2020, Form Energy respectfully submit its Track 2 proposals in this proceeding.

I. INTRODUCTION

Form Energy’s Track 2 proposals are summarized as follows, with detailed discussion in the body of this document:

- Guiding Principles: Form Energy proposes guiding principles the California Public Utilities Commission (“Commission”) should adopt to inform how it evaluates parties’ Track 2 and Track 3 proposals and to ensure that Resource Adequacy (“RA”) Program refinements support Senate Bill (“SB”) 100 and other state goals.
- Use of Marginal ELCC: Form Energy proposes that the Commission adopt the use of a marginal effective load carrying capacity (“ELCC”) methodology in the RA Program for renewable resources, stand-alone energy storage resources of various durations, and hybrid resources.
- Marginal ELCC and Marginal RA Value Lookup Tables: Form Energy proposes that the Commission develop regularly-updated marginal ELCC lookup tables for

renewable resources, stand-alone energy storage, and hybrid resources to provide stable and transparent investment signals that value resources accurately.

- Maximum Cumulative Capacity (“MCC”) Buckets: Form Energy proposes that the Commission abandon the use of MCC buckets and instead transition to using load serving entity (“LSE”)-specific portfolio energy sufficiency tests to be developed in Track 3.

II. GUIDING PRINCIPLES

Form Energy recommends that the Commission establish guiding principles to inform how it evaluates parties’ Track 2 and Track 3 proposals and to ensure that RA Program refinements support Senate Bill (“SB”) 100 and other state goals. These guiding principles should include the following:

- Stable investment signals: The RA program should provide LSEs and energy resource developers with stable signals about the kinds of new resources California needs to achieve its long-term goals and how the reliability contribution of these resources will be valued over time.
- Transparent methodologies and assumptions: Resource valuation methodologies, assumptions and modeling tools adopted in the RA Program should be sufficiently transparent that parties can reproduce the Commission’s results.
- Analytically-defined solutions: The Commission should rely as much as reasonably possible on accurate, analytically-determined RA program rules, resource capacity counting rules, and reliability assessments, and it should avoid rule-of-thumb-based practices that can hide reliability risks and distort assessments of both resource needs and resource value.
- Consistency between proceedings: Unless there is justification to do otherwise, the Commission should use consistent methodologies, tools and assumptions across proceedings, particularly IRP, RA and the Renewables Portfolio Standard (“RPS”) and other proceedings that set LSE resource procurement requirements.
- Alignment with long-term SB 100 goals: When considering any RA Program change, the Commission should evaluate whether the program change will

support or hinder the achievement of a 100% renewable and zero-carbon grid. Additionally, the Commission should evaluate whether the program change would be workable and relevant in a 100% renewable and zero-carbon grid without any fossil-fueled resources. If not, the Commission should either not pursue the change or it should identify it as an interim approach subject to future revision.

Our proposals below aim to align with these principles, and they identify where additional work may be needed to make them fully actionable.

III. PROPOSED USE OF MARGINAL ELCC

Form Energy supports the use of marginal ELCC values for renewable resources, stand-alone energy storage resources, and hybrid resources. Our rationale is simple: a marginal ELCC can provide stable investment signals that will help LSEs and market participants understand how the reliability value of specific resources, namely variable renewables and energy storage, will vary over time as resource portfolios evolve, and it will provide a missing investment signal that is necessary to encourage LSEs to pursue portfolios of firm, zero-carbon resources. By contrast, the Commission's current use of portfolio average ELCC values has several critical deficiencies: 1) it fails to provide stable investment signals by eroding the value of already-contracted resources and over-valuing the reliability contribution of new resources; 2) it neglects to account for the differing reliability contribution of different types of resources (e.g. short-duration daily-cycling storage resources, versus long-duration, multi-day cycling energy storage resources); and 3) it does not reflect resource portfolio changes that the Commission is initiating and planning for in other proceedings, namely IRP.

The use of a marginal ELCC methodology in California is justified for energy storage at present (whether in stand-alone or hybrid configurations), because the reliability value of an

energy storage resource is a function of both its nameplate capacity (in MW) and its capacity to store energy (in MWh). A marginal ELCC methodology has the ability to capture how this value will change over time, and it can provide essential missing information to the IRP proceeding (and to LSEs when they seek new resources) about the kinds of zero-carbon dispatchable resources that are likely to be needed to balance a 100% renewable and zero-carbon grid. If it neglects to adopt marginal ELCC values for energy storage, the Commission runs the risk of systematically overvaluing shorter-duration energy storage resources and undervaluing longer-duration energy storage resources.

If the Commission adopts marginal ELCC values and produces the array of marginal ELCC lookup tables that we recommend below, we believe the Commission can vastly simplify the challenge (and significantly improve the accuracy) of valuing hybrid resources.

We support the use of marginal ELCC values for *all new resources*, and we also propose that the marginal ELCC value attach to a specific resource at its commercial operation date (“COD”) and remain constant through a reasonable resource lifetime.

IV. MARGINAL ELCC AND MARGINAL RA VALUE LOOKUP TABLES

We propose that the Commission commit to developing a package of regularly-updated marginal ELCC values that reflect current *and forecasted* marginal ELCC values based on the current year’s resource mix and future resource portfolios identified in the IRP proceeding. A single year of ELCC values is insufficient to provide adequate investment signals to LSEs, resource developers and the IRP proceeding. The Commission should develop marginal ELCC values that reflect combinations of several minimum variables: COD years; energy storage

duration; region (NP-15 and SP-15), and resource portfolio (namely the IRP Preferred System Plan (“PSP”) portfolios related to each COD-year modeled, as well a a zero-carbon portfolio for each year).

A. Proposed marginal ELCC lookup table format

To illustrate our recommendation we propose the following set of example table templates below. In practice, the Commission would need to create multiple such hybrid resource tables, one for each combination of COD year, region, and renewable resource (e.g. solar vs wind). The approach below assumes that marginal ELCC and marginal RA values will not change within a single year, and that values will not change significantly between table updates, regardless of how many new resources come online in a single year.

Table 1: Stand Alone Storage Marginal ELCC Value Template

Stand Alone Energy Storage: Marginal ELCC (in %) for each Incremental MW									
COD Year: 2020 Portfolio: PSP 2020	2-hr	4-hr	6-hr	8-hr	12-hr	...	50-hr	100-hr	...
NP-15	X %	...							
SP-15	Y %	...							

Table 2: Stand Alone Renewable Marginal ELCC Value Template

Stand Alone Renewables: Marginal ELCC (in %) for each Incremental MW									
COD Year: 2020 Portfolio: PSP 2020	Jan	Feb	Mar	Apr	Sept	Oct	Nov	Dec
Solar NP-15	A %	...							
Solar SP-15	B %	...							
Wind NP-15	C %	...							
Wind SP-15	D %	...							

Table 3: Hybrid Resource Marginal ELCC Lookup Table Template (Storage/PV Example)

Hybrid Storage + PV: Marginal ELCC (in %) for each Incremental MW										
COD Year: 2020 Region: NP-15 Portfolio: PSP 2020		2-hr	4-hr	6-hr	8-hr	12-hr	...	50-hr	100-hr	...
Solar MW / Energy Storage (ESS) MW	0.1	X %	...							
	0.2	...								
	0.3									
	0.4									
	0.5									
	...									
	0.9									
	1.0									
	2.0									
	...									
	10.0									

Table 4: Hybrid Resource Marginal ELCC Lookup Table Template (Storage/Wind Example)

Hybrid Storage + Wind: Marginal ELCC (in %) for each Incremental MW										
COD Year: 2020 Region: NP-15 Portfolio: PSP 2020		2-hr	4-hr	6-hr	8-hr	12-hr	...	50-hr	100-hr	...
Wind MW / ESS MW	0.1	X %	...							
	0.2	...								
	0.3									
	0.4									
	0.5									
	...									
	0.9									
	1.0									
	2.0									
	...									
	10.0									

Tables 3 and 4 above are two examples of the kinds of information we recommend the CPUC should commit to generating and updating no less frequently than each two-year IRP cycle. The two tables above would only represent marginal ELCC values for a given year; thus, to provide a fuller set of investment signals, we recommend that the CPUC provide additional tables that each reflect marginal ELCC values for the following combinations of variables:

- COD Years: Current year (Y), Y+2, Y+5, Y+10, Y+15, and Y+20 to align with IRP analysis
- Regions: Although tables reflecting statewide values would be a significant improvement over today's baseline, we recommend that the Commission provide geographic granularity to distinguish, at minimum, between NP-15 and SP-15.
- Portfolios: For each COD year modeled, the Commission should calculate marginal ELCC values using two different resource portfolios: 1) the Preferred System Portfolio adopted in IRP, so that ELCC values reflect forecasted grid needs; and 2) a zero-carbon portfolio (without any existing fossil generation) to identify the true value that zero-carbon dispatchable resources provide. Our assessment is that the presence of existing fossil generation in portfolios used to calculate ELCC values will systematically overstate the ELCC value of shorter-duration storage and understate the ELCC value of longer-duration storage. This information is necessary to create long-term market signals to level the playing field between both short and long-duration storage, as well as long-duration storage and natural gas generation.

B. Example use of marginal ELCC value lookup tables

Tables 3 and 4 above would contain a list of marginal ELCC values (in %) that represent the value of an incremental 1MW of hybrid solar and storage resources. ELCC values in this case would always be $\leq 100\%$. To calculate the RA value of a hybrid resource using these tables, one would multiply the ELCC value by the combined capacity of the hybrid solar + storage resource. For example, consider a hybrid 20 MW PV system + 20 MW, 4-hr storage system,

with a COD of 2020 in the NP-15 region. To look up the marginal ELCC value of this resource, one only has to find the row and column in Table 3 where a solar-to-storage capacity ratio of 1.0 intersects with 4-hr storage. If this resource were to have a hypothetical combined marginal ELCC value of 75% in this table, one would calculate the hybrid resource's RA value as follows:

$$0.75 * (20 \text{ MW PV} + 20 \text{ MW (4-hr) storage}) = 30 \text{ MW}.$$

In the Appendix we illustrate an alternative and perhaps more intuitive way to represent the same information of Tables 3 and 4. Rather than develop marginal ELCC lookup tables, the Commission could simply publish hybrid resource *RA value* lookup tables that show how the RA value in MW of hybrid resources varies based on the ratio of renewables to storage, as well as storage duration. The methodology and results would be the same; the Appendix tables only differ in how the information is displayed.

C. Administrative feasibility of creating marginal ELCC lookup tables

Form Energy believes that our proposal to create marginal ELCC lookup tables is both administratively feasible and would not significantly burden Commission staff. Although the lookup tables would contain a significant amount of new information, our experience conducting production cost and capacity expansion modeling leads us to conclude that the Commission has already done, and is already planning to do, the most time-intensive work necessary to produce marginal ELCC lookup tables, which is to set up a system production cost model with publicly-vetted assumptions and scenarios. Commission staff are already doing this work on a cyclical basis in IRP. The incremental work to produce marginal ELCC lookup tables will likely require no more than a few weeks of staff or consultant time. Once this effort becomes routine, it

should save the Commission the time, and ratepayers the expense, of responding to emergency resource procurement needs as occurred in 2019, due to sudden and significant changes in the ELCC valuation framework that devalues resources LSEs already have under contract.

D. Continuing implementation process to refine the marginal ELCC methodology and modeling approach

Form Energy recommends that the Commission commit to developing and using marginal ELCC lookup tables for renewables, stand-alone storage, and hybrid resources in either Track 2 or Track 3, and that the Commission convene a process to refine both the modeling tools and modeling approach Commission staff use to calculate marginal ELCC values. We would be equally supportive of formal workshops or an informal working group with opportunities to file formal comments. The Commission has invested considerable time and effort into making its IRP process admirably transparent and ensuring that parties have an opportunity to comment on IRP inputs, assumptions and modeling approach. It is equally as important to ensure that the modeling approach and tools used to establish marginal ELCC calculations are similarly transparent, because ELCC values and IRP portfolios are closely related and have significant impacts on future resource needs and system costs.

V. MAXIMUM CUMULATIVE CAPACITY BUCKETS

We recommend that the Commission abandon the use of MCC buckets, an approach that lacks adequate transparency and that is too crude a mechanism to guard against energy insufficiency risks, which appears to be the Commission's main concern. In lieu of MCC buckets, we recommend that the Commission do the following in Track 3 to ensure that the Commission sets appropriate long-term investment signals and adequately assesses reliability

risks: 1) establish clear definitions of reliability conditions that future LSE portfolios must meet to achieve a reliable 100% renewable and zero-carbon grid; and 2) develop a portfolio assessment methodology by which LSEs prove, or the Commission or CAISO confirm, that LSE portfolios can meet the Commission's defined reliability conditions.

A. Proposed reliability conditions for future portfolio energy sufficiency tests

Form Energy recommends that the Commission define several conditions that are most likely to cause reliability risks in a 100% renewable and zero-carbon grid. These conditions include:

1. Summer net peak demand over a multi-day weather event
2. Winter net peak demand over a multi-day weather event with low renewable output
3. A representative grid contingency event in a local reliability area.

The RA Program should evolve to require LSEs to demonstrate that their RA portfolios can maintain energy sufficiency during each of these conditions, including in local reliability areas.

To achieve SB 100 goals, it is important that the Commission move away from reliability standards that are based solely on meeting a single-day net peak demand. Instead, the Commission should reform its reliability standards to reflect future reliability challenges that will occur along two dimensions and will vary seasonally: sufficient capacity (in MW) to meet net peaks; and sufficient energy (in MWh) to meet net peak load shapes over multiple sequential or near-sequential days during weather events or extended grid contingencies. We hope to develop these recommendations further in Track 3 proposals.

VI. CONCLUSION

Form Energy appreciates this opportunity to submit Track 2 proposals and looks forward to working with the Commission and stakeholders in this proceeding to continue developing and reforming the Commission's RA program.

Respectfully submitted,

/s/ Jason Houck

Jason Houck

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Dated: February 21, 2020

APPENDIX: MARGINAL RA LOOKUP TABLE FORMAT

As an alternative to producing marginal ELCC value lookup tables for hybrid resources, the Commission could instead produce tables that express RA values for given hybrid resources and that avoid the complexity of representing multiple storage durations in a single table. These two approaches are fundamentally the same; they simply express information differently. Marginal RA value tables provide information that more intuitive (i.e. MWs of RA value for a given resource), the downside being that the Commission would need to produce a larger number of tables (one for each duration of storage resource modeled), and ELCC values would be implicit in the MW results, not directly expressed.

Table A1: Hybrid 4-HOUR Storage + Solar Resource Adequacy Value Table

4-HOUR Energy Storage + PV Hybrid Systems: Resource Adequacy Value (MW)									
COD Year: 2020 Region: NP-15 Portfolio: PSP 2020		Energy Storage Capacity (MW) (4-hr Storage)							
Nameplate MW		0	10	20	30	40	...	500	...
PV Capacity (MW)	0	0 Mw	...						
	10	...	X MW						
	20								
	30								
	40								
	...								
	500								
	...								

Table A2: Hybrid 8-HOUR Storage + Solar Resource Adequacy Value Table

8-HOUR Energy Storage + PV Hybrid Systems: Resource Adequacy Value (MW)									
COD Year: 2020 Region: NP-15 Portfolio: PSP 2020		Energy Storage Capacity (MW) (4-hr Storage)							
Nameplate MW		0	10	20	30	40	...	500	...
PV Capacity (MW)	0	0 Mw	...						
	10	...	X MW						
	20								
	30								
	40								
	...								
	500								
	...								

This approach would produce unique lookup tables for different durations of energy storage resources: that is, the CPUC would need to produce separate tables for hybrid resources using 6-hr storage, 8-hr storage, and so on, including and up to 100-hr+ systems. The CPUC would then produce a separate set of tables for wind+storage hybrid systems, repeating the process for different regions (NP-15 and SP-15) as well as forecasts looking out 2, 5, 10, 15, and 20 years based on IRP portfolios. (By contrast, the marginal ELCC table format we recommend is a more compact way to encapsulate information in a single table and to reduce the overall number of tables needed, but the approaches are fundamentally the same and produce the same results.)

A. Illustrative Example: 20 MW PV + 20 MW (4-hr) Storage Hybrid

Under the marginal RA value approach, the CPUC would use its production cost model

to produce a table of RA values (in MW) for different sizes and ratios of hybrid systems in the same way that it would develop marginal ELCC values. Resource developers or LSEs would simply look up the appropriate CPUC-defined RA value for a given hybrid system design.

For example, a hybrid resource with a 20MW PV system combined with a 20 MW (4-hr) storage system would simply look up the RA value (in MW) in Table A1 above to identify the marginal RA credit the resource would receive. If the marginal ELCC for this resource were 75%, for example, the RA value expressed in the table would be $0.75 \times (20 \text{ MW PV} + 20 \text{ MW (4-hr) storage}) = 30 \text{ MW}$. This approach captures the possibility that some hybrid resources may have an RA value that is larger than the nameplate capacity of the renewable generator. However, it also captures the possibility that the RA value could be less than the combined nameplate capacity of the renewable and storage resources (which could occur, for example, if the grid is saturated with 4-hr storage resources and needs longer-duration storage resources).